

**SAE-AMS1431**

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Army - EA  
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**Adopting Activities:**

Air Force - 11  
 (Project 6850-1333)

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Army - MD  
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400 Commonwealth Drive, Warrendale, PA 15096-0001

# AEROSPACE MATERIAL SPECIFICATION

**SAE**

**AMS 1431A**

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Superseding AMS 1431

Submitted for recognition as an American National Standard

## COMPOUND, SOLID DEICING/ANTI-ICING Runways and Taxiways

### 1. SCOPE:

#### 1.1 Form:

This specification covers a deicing and anti-icing compound in the form of a solid.

#### 1.2 Applications:

This compound is used typically for deicing/anti-icing aircraft maneuvering areas, such as airport aprons, runways, and taxiways, but usage is not limited to such applications.

#### 1.3 Material Compatibilities:

While this specification covers technical requirements for solid deicing/anti-icing compounds, it does not address the compatibility issue of combining deicers/anti-icers during the operational phase. It is the user's responsibility to become familiar with the safe and proper use of the components when applying multiple deicers/anti-icers.

#### 1.4 Pavement Friction Evaluation:

It is important after applying deicing/anti-icing compounds to ascertain the friction coefficient characteristics of the affected surface prior to aircraft landing operations.

#### 1.5 Safety-Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

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AMS 1431A

SAE

AMS 1431A

## 2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

## 2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

- AMS 2470 Anodic Treatment of Aluminum Alloys, Chromic Acid Process
- AMS 2475 Protective Treatments, Magnesium Alloys
- AMS 2825 Material Safety Data Sheets
- AMS 4037 Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn, (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated
- AMS 4041 Aluminum Alloy Sheet and Plate, Alclad, 4.4Cu - 1.5Mg - 0.60Mn, (Alclad 2024 and 1-1/2 Alclad 2024-T3 Flat Sheet; 1-1/2 Alclad 2024-T351 Plate)
- AMS 4049 Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, (Alclad 7075; -T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated
- AMS 4376 Magnesium Alloy Plate, 3.0Al - 1.0Zn, (AZ31B-H26), Cold Rolled and Partially Annealed
- AMS 4911 Titanium Alloy Sheet, Strip, and Plate, 6Al - 4V, Annealed
- MAM 4911 Titanium Alloy Sheet, Strip, and Plate, 6Al - 4V, Annealed, Metric
- AMS 5045 Steel Sheet and Strip, 0.25 Carbon, maximum, Hard Temper

## 2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

- ASTM C 672 Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals
- ASTM D 1193 Reagent Water
- ASTM D 1568 Sampling and Chemical Analysis of Alkylbenzene Sulfonates
- ASTM E 70 pH of Aqueous Solutions with the Glass Electrode
- ASTM E 203 Water Using Karl Fischer Reagent
- ASTM E 502 Selection and Use of ASTM Standards for the Determination of Flash Point of Chemicals by Closed Cup Methods
- ASTM F 483 Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
- ASTM F 484 Stress Cracking of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds
- ASTM F 485 Effects of Cleaners on Unpainted Aircraft Surfaces
- ASTM F 502 Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
- ASTM F 519 Mechanical Hydrogen Embrittlement Testing of Plating Processes and Aircraft Maintenance Chemicals
- ASTM F 945 Stress Corrosion of Titanium Alloys by Aircraft Engine Cleaning Materials

AMS 1431A

SAE

AMS 1431A

## 2.2 ASTM Publications (Continued):

- ASTM F 1104 Preparing Aircraft Cleaning Compounds, Liquid Type, Water Base,  
for Storage Stability Testing  
ASTM F 1110 Sandwich Corrosion Test  
ASTM F 1111 Corrosion of Low Embrittling Cadmium Plate by Aircraft  
Maintenance Chemicals

## 2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins  
Avenue, Philadelphia, PA 19111-5094.

- MIL-P-83310 Plastic Sheet, Polycarbonate, Transparent  
MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of  
Packaging Requirements

## 2.4 APHA Publications:

Available from American Public Health Association, 1015 Eighteenth Street,  
NW, Washington, DC 20005.

Standard Methods for the Examination of Water and Waste Water

## 3. TECHNICAL REQUIREMENTS:

## 3.1 Material:

The composition of the compound shall include additives, such as corrosion  
inhibitors, coating agents, etc., as required to produce a product meeting the  
requirements of 3.2.

3.1.1 Vendor shall report both the product chemical analysis, determined in  
(R) accordance with a method acceptable to purchaser, and total water content,  
determined in accordance with ASTM E 203.

3.1.2 Vendor shall provide a phase diagram relating product dilution to freeze  
point. Delivered product shall be within +4 °C (+7 °F) of the  
preproduction value.

## 3.2 Properties:

The compound shall conform to the following requirements, determined in  
accordance with specified test methods:

3.2.1 pH: Shall be within  $\pm 0.5$  of the preproduction value established in  
(R) 4.2.3, determined in accordance with ASTM E 70.

3.2.2 Flash Point: Shall be not lower than 100 °C (212 °F), determined in  
(R) accordance with ASTM E 502.

3.2.3 Chloride Content: The level of soluble chloride on a dry basis shall not  
exceed 250 ppm, determined in accordance with APHA Standard Methods for the  
Examination of Water and Waste Water, Method 112A.

AMS 1431A

SAE

AMS 1431A

- 3.2.4 (R) Storage Stability: The compound, stored in a closed container for at least one year in accordance with manufacturer's recommendations, shall meet all other technical requirements of this specification. In addition, the compound shall not deliquesce or otherwise deteriorate, determined in accordance with ASTM F 1104.
- 3.2.5 (R) Effect on Transparent Plastics: Compound, diluted with ASTM D 1193, Type IV, water to 15% by weight of solids taking into account water contained in the compound, shall not craze, stain, or discolor Type C stretched acrylic plastics, determined in accordance with ASTM F 484 on specimens stressed to an outer fiber stress of 4500 psi (31.0 MPa) for 8 hours. The diluted compound shall also not craze, stain, or discolor MIL-P-83310 polycarbonate plastic or polysulfone, determined in accordance with ASTM F 484 on specimens stressed to an outer fiber stress of 3000 psi (20.7 MPa) for 30 minutes  $\pm$  2.
- 3.2.6 (R) Effect on Painted Surfaces: Compound, diluted with ASTM D 1193, Type IV, water to 15% by weight of solids taking into account water contained in the compound, shall neither decrease the paint film hardness by more than two pencil hardness levels nor shall it produce any streaking, discoloration, or blistering of the paint film, determined in accordance with ASTM F 502.
- 3.2.7 (R) Effect on Unpainted Surfaces: Compound, diluted with ASTM D 1193, Type IV, water to 15% by weight of solids taking into account water contained in the compound, shall neither produce streaking, residue, nor leave any permanent stains which require polishing to remove, determined in accordance with ASTM F 485.
- 3.2.8 (R) Scaling Resistance of Concrete Surfaces: The condition of the concrete surface shall have a rating not greater than 2 for 50 freeze-thaw cycles, determined in accordance with ASTM C 672 except that a 15% by volume solution of the compound in tap water shall be substituted for calcium chloride.
- 3.2.9 Corrosion of Metal Surfaces: Compound, diluted with ASTM D 1193, Type IV, water to 5% and 15% by weight solids taking into account water contained in the compound, shall meet the following requirements:
- 3.2.9.1 (R) Sandwich Corrosion: Specimens of AMS 4045 and AMS 4049 aluminum alloys, after testing in accordance with ASTM F 1110, shall not show a corrosion rating worse than one or worse than control panels tested with ASTM D 1193, Type IV, water.
- 3.2.9.2 (R) Total Immersion Corrosion: Test panels shall neither show evidence of pitting or corrosion nor cause a weight change of any test panel greater than that shown in Table 1, determined in accordance with ASTM F 483 for 168 hours. Weight changes shall be reported for the first 24-hour period and for the remaining 144-hour period.

AMS 1431A

SAE

AMS 1431A

TABLE 1 - Total Immersion Corrosion

Test Panel	Maximum Weight Change mg/cm <sup>2</sup> per 24 hours
AMS 4037 Aluminum Alloy, anodized as in AMS 2470	0.3
AMS 4041 Aluminum Alloy	0.3
AMS 4049 Aluminum Alloy	0.3
AMS 4376 Magnesium Alloy, dichromate treated as in AMS 2475	0.2
AMS 4911 or MAM 4911 Titanium Alloy	0.1
AMS 5045 Carbon Steel	0.8

- 3.2.9.3 Low-Embrittling Cadmium Plate: Test panels, coated with low-embrittling cadmium plate, shall not show a weight change greater than 0.3 mg/cm<sup>2</sup> per 24 hours, determined in accordance with ASTM F 1111.
- 3.2.9.4 Hydrogen Embrittlement: Compound shall be non-embrittling, determined in accordance with ASTM F 519, Type 1a, 1c, or 2a.
- 3.2.9.5 Stress-Corrosion Resistance: The diluted compound shall not cause cracks in AMS 4911 or MAM 4911 titanium alloy, determined in accordance with ASTM F 945, Method A.
- 3.2.10 Performance: The compound, used in accordance with manufacturer's (R) recommendation, shall remove accumulated frozen deposits of frost and ice from aircraft maneuvering areas, such as airport aprons, runways, and taxiways.

### 3.3 Quality:

The compound, as received by purchaser, shall be uniform, free-flowing, and free from foreign material detrimental to usage of the compound.

## 4. QUALITY ASSURANCE PROVISIONS:

### 4.1 Responsibility for Inspection:

(R)

The vendor of compound shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the compound conforms to the requirements of this specification.

AMS 1431A

SAE

AMS 1431A

## 4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for product chemical analysis and total water (R) content (3.1.1), pH (3.2.1), flash point (3.2.2), and chloride content (3.2.3) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests for effect on transparent plastics (3.2.5), effect (R) on painted surfaces (3.2.6), effect on unpainted surfaces (3.2.7), scaling resistance of concrete surfaces (3.2.8), and corrosion of metal surfaces (3.2.9) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser. In all cases, periodic tests shall be performed at least once every three years.

4.2.3 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of the compound to a purchaser, when a change in ingredients and/or manufacturing procedures requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.3.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test compound shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

## 4.3 Sampling and Testing: (R)

Shall be in accordance with all applicable requirements of ASTM D 1568; a lot shall be all compound produced in one continuous manufacturing operation from the same batches of raw materials and presented for vendor's inspection at one time.

4.3.1 When a statistical sampling plan has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3 and the report of 4.5 shall state that such plan was used.

## 4.4 Approval:

4.4.1 Sample compound shall be approved by purchaser before compound for production use is supplied, unless such approval be waived by purchaser. Results of tests on production compound shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, and methods of inspection on production compound which are essentially the same as those used on the approved sample compound. If necessary to make any change in ingredients or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in ingredients and/or manufacturing procedures and, when requested, sample compound. Production compound made by the revised procedure shall not be shipped prior to receipt of reapproval.